"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

ARKHANGEL'SKIY, A.V.; ISUPOV, I.V. (Saratov)

Histochemical changes in myocardial infarction during its healing. Arkh. pat. 27 no.3:25-30 '65.

(MIRA 18:5)

1. Kafedra patologicheskoy anatomii (zav. - prof. A.M. Antonov) Saratovskogo meditsinskogo instituta.

APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

ISUPOV, K. N.

KAZANTSEV, N. D., TURUBINER, A. M., PAVLOV, I. V., PYATNITSKIY, P. P.,
GRIGOR'YEV, V. K., ISUPOV, K. N.

Agricultural Laws and Legislation

"Questions of collective farm and land law". Reviewed by Kalandadze, A., Izv. AN SSSR., Otd, ekon i prava, No. 1, 1952.

9. Monthly List of Russian Accessions, Library of Congress, August 1953 Unclassified.
2

APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

ISUPOV, L.

Progressive practices of farm building at the provincial exhibition. Sel'. stroi. 12 no.3:31 Mr '58. (MIRA 11:3)

1. Starshiy inzhener Upravleniya stroitel'stva v kolkhozakh Kirovskoy oblasti.

(Kirov--Agricultural exhibitions)

APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

ISUPOV, N., inzh.

The "Kosmos" miniature radio receiver. Radio no.2:35-36 F '65.
(MIRA 18:4)

APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

L 27068-66

ACC NR: AP6017402 SOURCE CODE: UR/0107/66/000/002/0044/0045

AUTHOR: Isupov, N. (Engineer)

28
B

ORG: none

TITLE: Mikrosuper T-7"Rubin"

SOURCE: Radio, no. 2, 1966, 44-45

TOPIC TAGS: radio receiver, transistorized circuit

ABSTRACT: This radio, which measures 45x54x24 mm and weighs 90 g, will be manufactured in two versions, one for the 525-1605 frequencies and the other, for 150-408 frequencies. Its maximum sensitivity is 3 mv/m. It is a 7-transistor receiver which can perform reliably at temperatures of -10 to plus-40°C. Its housing is of colored plastic. A leather carrying case is provided. Its four batteries can be recharged from any power system with an AC voltage of 100 to 240 v. The low weight and small dimensions of this transistor radio make it suitable for use under any conditions: at home, during walking, on the beach, while fishing, or in the forest. Orig. art. has: 1 figure and 1 table. [JPRS]

SUB CODE: 09 / SUBM DATE: none

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

L 0379-66

ACC NR: AP5026763 SOURCE CODE: UR/0286/65/000/017/0041/0041

INVENTOR: Isupov, N. A.; Zhizhin, V. T.

TITLE: A miniature variable capacitor. Class 21, No. 174272 [announced by Sarapul Radio Plant im. Sergo Ordzhonikidze (Sarapul'skiy radiozavod)]

SOURCE: Byulleten' izobreteniy i tovarnykh znakov, no. 17, 1965, 41

TOPIC TAGS: variable capacitor, electronic component, miniature electric equipment

ABSTRACT: This Author's Certificate introduces a miniature variable capacitor which contains stator and rotor plates and insulating dielectric inserts fastened tightly to guide rods longitudinally located with respect to the axis. The device is equipped with a thrust bearing whose plate is used as a spring element. Assembly of the capacitor and fastening to the mounting plate are simplified by using a floating stator with plates which slide freely on the guide rods. Rectangular slots are located along the base of the condenser housing for fastening the device to the mounting panel.

UDC: 621.319.43

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

L 6379-66
ACC NR: AP5026763

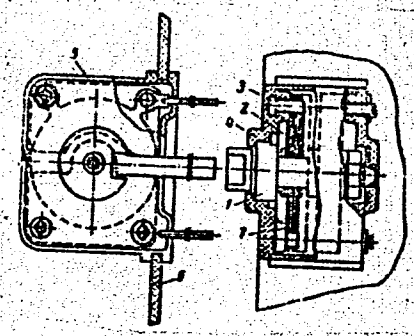

Fig. 1. 1--rotor axis; 2--rotor plates; 3--guide rods; 4--base; 5--housing; 6--mounting panel; 7--stator plates

SUB CODE: EC/ SUBM DATE: 07May64/ ORIG REF: 000/ OTH REF: 000

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APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

ISUPOV, V.

Present foreign exchange situation in Great Britain; crisis of the pound sterling [with English summary in insert]. Vnesh. torg. 28 no.3:23-28 '58. (MIRA 11:5)
(Great Britain--Foreign exchange problem)

APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

Isupov, V.A.

[illegible] AEC-tr-[illegible]

FERROELECTRIC PROPERTIES OF SOLID SOLUTION OF BARIUM STANNATE IN BARIUM TITANATE. G. A. Smolenskii (Smolensky) and V. A. Isupov. Translated from Zhur. Tekh. Fiz. 24, [illegible](195[illegible]). [illegible]p.

Volume electrostriction, dielectric permeability, elastic modulus, resonance frequencies, and other ferroelectric properties of solid solutions of $BaSnO_3$ in $BaTiO_3$ are studied. (T.R.H.)

APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

Isupov, V. A.

Phase changes of certain solid solutions having electrical properties of Rochelle salt. G. A. Smolenskii and V. A. Isupov. *Doklady Akad. Nauk S.S.S.R.* 96, 53-4(1954).—The constitutional diagram for $BaTiO_3$-$BaSnO_3$ shows that up to 12% $BaSnO_3$ the solid-soln. field is divided into areas of cubic, tetragonal, orthorhombic, and rhombohedric crystals, and only one transformation can be observed on passing the Curie point in the presence of 12% or more of $BaSnO_3$, namely from cubic to rhombohedral. An increased $BaSnO_3$ content reduces elec. moment, destroys spontaneous polarization defined by the dipolar interaction, and lowers the Curie point. Shifting of low-temp. phase changes is caused by simultaneous unidirectional movements of Sn and Ti ions within individual domains occurring at definite $BaTiO_3$ concns. at temps. under the Curie point. Ions move with the greatest freedom along the [111] and with most difficulty along [001]. Higher $BaSnO_3$ concn. moves the transformation temp. upward. The Curie point of $BaTiO_3$-$BaZrO_3$ system shifts at low temps. more slowly than in the $BaSnO_3$-$BaTiO_3$ system. This is caused by different characteristics of bonds of the Zr and Sn ions with those of O. Tin ions move to a lesser extent in respect to the center of the lattice than do Zr ions. A higher $BaZrO_3$ concn. also moves the transformation point higher, and at 18% or more only the rhombohedral phase is present. In the $BaTiO_3$-$SrTiO_3$ system, the transformation point shifts towards lower temps. with higher $SrTiO_3$ content more slowly than does the Curie point.

J. D. (Jaffe)

(1)

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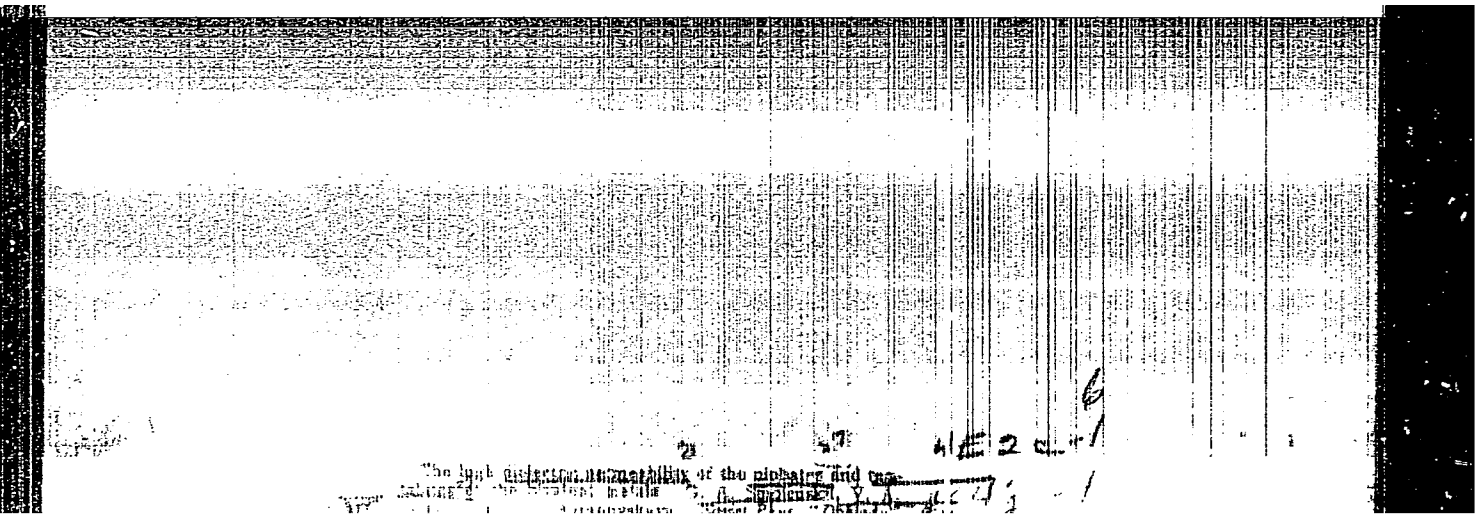

APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

Isupov, V.A.

USSR/Electricity - Semiconductors G-3

Abs Jour : Referat Zhur - Fizika, No 5, 1957, 12150

Author : Isupov, V.A.

Inst : Institute of Chemistry of Silicates, Academy of Sciences, USSR, Leningrad.

Title : Concerning the Problem of the Causes of Formation of the Curie Region in Certain Ferroelectric Solid Solutions.

Orig Pub : Zh. tekhn. fiziki, 1956, 26, No 9, 1912-1916

Abstract : A study of the temperature dependence of the dielectric constant (ε) of specimens of solid solutions has shown, that as the content of non-ferroelectric compounds in the solid solution is increased, the peak of ε , corresponding to the phase transition from the pyroelectric state into the ferroelectric state, becomes more and more flattened out. Similar phenomena are observed in the

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Isupov, V.A.

USSR/Electricity - Semiconductors G-3

Abs Jour : Referat Zhur - Fizika, No 5, 1957, 12136

Author : Smolenskiy, G.A., Isupov, V.A., Agranovskaya, A.I.

Inst : -

Title : High Dielectric Constant of Niobates and Tantalates of Divalent Metals.

Orig Pub : Dokl. AN SSSR, 1956, 108, No 2, 232-235

Abstract : An investigation was made of the dielectric properties of niobates and tantalates of Ca, Cd, Sr, Pb, and Ba. To prepare the specimens, finely ground initial materials were pressed and fired. The resultant material was again powdered, pressed, and subjected to final firing. Measurements were made of ε , $\tan\delta$, and of the dependence of ε on the temperature T of the resultant polycrystalline specimens. The investigated materials have high values of ε with a negative temperature coefficient (TK_{ε}). A positive $TK\varepsilon$ is observed only by the

Card 1/2

Inst. Chem. Silic. AS USSR

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

Isupov V. A.

PHASE I BOOK EXPLOITATION 676

Smolenskiy, Georgiy Anatol'yevich, Doctor of Physical and Technical Sciences, Isupov, Vladislav Aleksandrovich, Engineer

Segnetoelektriki (Seignetoelectric Substances) [2d. ed., rev. and enl.] Leningrad, Leningradskiy Dom nauchno-tekhnicheskoy propagandy, 1957, 43 p. (Obshchestvo po rasprostraneniyu politicheskikh i nauchnykh znaniy. Poluprovodniki, vyp. 15) 15,000 copies printed.

Sponsoring Agencies: Akademiya nauk SSSR. Institut poluprovodnikov, and Leningradskiy Dom nauchno-tekhnicheskoy propagandy.

Tech. Ed.: Freger, D. P.; Editorial Board: Ioffe, A. F., Academician (Ed. in Chief), Sominskiy, M. S., Candidate of Physical and Mathematical Sciences (Asst. Ed. in Chief), Maslakovets, Yu. P., Doctor of Physical and Mathematical Sciences, Smolenskiy, G. A., Doctor of Physical and Mathematical Sciences, Shalyt, S. S., Doctor of Physical and Mathematical Sciences, Regel', A. R., Candidate of Physical and Mathematical Sciences, Subashiyev, V. K., Candidate of Physical and Mathematical Sciences, Shagurin, K. A., Engineer, Achkinadze, Sh. D., Engineer.

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APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

PURPOSE: This brochure is addressed to engineers and technicians working with semiconductor devices and materials.

COVERAGE: This monograph is the 15th of a series entitled "Poluprovodniki" (Semiconductors). A list of the 18 titles constituting the series is given at the end of each brochure. For translation of these titles, see abstract Nr. 674. The author briefly reviews the history of ferromagnetism, and of seignetoelectricity. He points out the practical applications of seignetoelectric phenomena in television, radio, electronics, etc. He makes a summary comparison of the properties of ferromagnetic materials with the properties of seignetoelectric materials. There are 16 Soviet sources, and 4 English. No personalities are mentioned.

TABLE OF CONTENTS:

APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

Seignetoelectric Substances

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

Isupov, V.A.

SUBJECT: USSR/Luminescence

48-3-18/26

AUTHOR: Isupov V.A.

TITLE: Dielectric Permittivity of Niobates and Tantalates of Bivalence Metals (Dielektricheskaya pronitsayemost' niobatov i tantalatov dvukhvalentnykh metallov)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya fizicheskaya, 1957, Vol 21, #3, pp 402-410 (USSR)

ABSTRACT: Investigation of dielectric properties of niobates and tantalates of bivalence metals is of considerable interest and was the subject of this paper.

Various niobates and tantalates of bivalence metals were investigated and it was found out that they possess high values of dielectric permittivity and a negative temperature coefficient of the latter. The highest values of dielectric permittivity was shown by the following niobates: lead metaniobate (ε = 280), cadmium pyroniobate (500 to 580), cadmium metaniobate (90) and lead pyroniobate (144), and the following tantalates: strontium metatantalate (100 to 115), lead

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

TITLE: Dielectric Permittivity of Niobates and Tantalates of Bivalence Metals (Dielektricheskaya pronitsayemost' niobatov i tantalatov dvukhvalentnykh metallov)

metatantalate (310), cadmium pyrotantalate (72 to 82), strontium pyrotantalate (110 to 120) and lead pyrotantalate (100 to 114).

The temperature-dependence of dielectric permittivity was studied in wide ranges. It was found out that:
The dielectric permittivity of lead metatantalate increases with raising temperature and reaches its maximum at 240°C. Dielectric hysteresis loops are observed below the maximum, which confirms the existence of ferro-electric properties.

The value of dielectric permittivity of strontium pyrotantalate increases with cooling and attains its maximum at temperatures which vary for different samples from -55 to -84°C. Hysteresis loops are observed below the maximum, which indicates that strontium pyrotantalate is a ferroelectric. The second maximum is observed at temperatures from - 150 to -190°C.
In additions to this, the following solid solutions were investigated: $Sr_2Ta_2O_7$ - $Sr_2Nb_2O_7$; $Sr_2Ta_2O_7$ - $Ba_2Ta_2O_7$;

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

48-3-18/26

TITLE: Dielectric Permittivity of Niobates and Tantalates of Bivalence Metals (Dielektricheskaya pronitsayemost' niobatov i tantalatov dvukhvalentnykh metallov)

$Sr_2Ta_2O_7$ - $Ca_2Ta_2O_7$; solid solutions of the 2nd kind: $BaTiO_3$ - $Ba_{0.5}TaO_3$ and $BaTiO_3$ - $BaTaO_{3.5}$, and polycrystallic samples of solid solutions of $Na(Nb,Ta)O_3$.

It is possible that solid solutions of barium niobate and tantalate will find applications in technics.

Lead metaniobate and lead metatantalate and their solid solutions can be applied for piezotransformers operating at high temperatures due to their high values of Curie point.

The article contains 9 figures and 3 tables. The bibliography lists 10 references, of which 1 is Slavic (Russian).

INSTITUTION: Institute of Semiconductors of the USSR Academy of Sciences

PRESENTED BY:

SUBMITTED: No date indicated

AVAILABLE: At the Library of Congress

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

AUTHOR: Isupov, V. A. 57-27-7-36/40

TITLE: The Dielectric Permeability of Mixtures Near to $BaTiO_3$ in the $BaO-MgO-TiO_2$-System (Dielektricheskaya pronitsayemost' sostavov, blizkikh k $BaTiO_3$ v sisteme $BaO-MgO-TiO_2$).

PERIODICAL: Zhurnal Tekhnicheskoy Fiziki, 1957, Vol. 27, Nr 7, pp. 1617-1619 (USSR)

ABSTRACT: The dependence of ε and tgδ of polycrystalline samples on temperature was investigated in the systems

$$BaTiO_3 \frac{\cdot}{\cdot} MgTiO_3 \text{ and } BaTiO_3 \frac{\cdot}{\cdot} \text{"BaO·MgO"}.$$

It is shown that the Curie temperature and ε, especially at the peak somewhat decrease with increasing content of "BaO·MgO". Somewhat below the Curie temperature an anomaly (break in the curve) which upon heating is accompanied by the characteristic decrease in tgδ was observed for $\varepsilon = f(T)$. Upon an increase in the content of "BaO·MgO" the anomaly of ε was observed at much lower temperatures. It may be assumed that the observed ahomaly of ε corresponds to the phase-transition which is not characteristic of pure $BaTiO_3$, No.

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APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

The Dielectric Permeability of Mixtures Near to $BaTiO_3$ in the $BaO-MgO-TiO_2$-System 57-27-7-36/40

anomaly of ε was observed in the case of 5 % Mol "BaO·MgO", but the decrease in tgδ took place at the same temperature as for 2% Mol. At 5% Mol a heterogeneous mixture apparently already forms. For the mixtures of the $BaTiO_3$ —— $MgTiO_3$ - system the curve of the dependence of ε on the temperature had the same shape, only the quantities of ε were a little lower. The presence of the anomaly of ε somewhat below the Curie temperature does not permit in this system either to draw conclusions on the type of solid solution forming upon introduction of MgO into $BaTiO_3$. There is 1 figure and 1 reference.

ASSOCIATION: Institute for Semiconductors AS USSR, Leningrad
(Institut poluprovodnikov AN SSSR, Leningrad)

SUBMITTED: February 5, 1957

AVAILABLE: Library of Congress

1. Barium oxide-magnesium oxide-titanium dioxide system-Dielectric properties 2. Dielectric properties-Measurement

Card 2/2

APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

Isupov, V. A.

AUTHORS: Smolenskiy, G. A., Isupov, V. A., Agranovskaya, A. I., 57-11-15/33
Sholokhova, Ye. D.

TITLE: Non-Seignette-Electrical Phase Transition in Solid Solution in $(Ca,Sr)(Ti,Zr)O_3$ and $Na(Nb,Ta)O_3$ Systems (Nesegnetoelektricheskiye fazovyye perekhody v tverdykh rastvorakh, obrazuyushchikhsya v sistemakh $(Ca,Sr)(Ti,Zr)O_3$ i $Na(Nb,Ta)O_3$).

PERIODICAL: Zhurnal Tekhn. Fiz., 1957, Vol. 27, Nr 11, pp.2528-2534 (USSR)

ABSTRACT: The purpose of this work was to explain the character of these phase transitions. Based on the experiments as well as on the explanations given you can say that in solid $(Ca,Sr)(Ti,Zr)O_3$ - solutions and especially in solid $(Ca,Sr)(Ti,O_3)$-solutions ordinary crystallographic transitions take place and that,neither calcium-titanate nor the mentioned solid solutions are anti-seignette-electrics. The authors are of opinion that in natrium-niobate at 480° and 640°C as well as in natrium-tantalate at 475°C, and in consequence of this also in solid $Na(Nb,Ta)O_3$ -solutions ordinary crystallographic transitions take place. Actually the phase transitions at 480° and 640° in natrium-niobate displace into the range of lower temperatures in the case of a substitution of a natrium ion, smaller according to its measurements,by the greater potassium ion. The authors conclude that natrium-tantalate is not a seignette-electric. There are 7 figures and

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

Isupov, V. A.

AUTHORS: Isupov, V. A., Khomutetskiy, O. K. 57-12-4/19

TITLE: An Investigation of the Dielectric Polarization of the Cadmium Pyroniobate and of Some Solid Solutions on Its Basis (Dielektricheskya polyarizatsiya pironiobata kadmiya i nekotorykh tverdykh rastvorov na yego osnove).

PERIODICAL: Zhurnal Tekhnicheskoy Fiziki, 1957, Vol. 27, Nr 12, pp. 2704-2717 (USSR)

ABSTRACT: In this paper, the dielectric polarization of polycrystalline samples of cadmium pyroniobate was investigated in strong and in weak electric fields. Moreover, a series of systems of solid solutions on the basis of cadmium pyroniobate was analyzed. The authors tried to establish such a system of solid solutions, which showed a rise of the Curie-temperature in comparison to the pyroniobate. An anomalous dependence of the dielectric polarization of the field strength at temperatures below the Curie-point was discovered. It is shown, that a partial substitution of the Cd^{2+}-ions in the cadmium pyroniobate by Mg^{2+} -, Sr^{2+} -, Zn^{2+}-, $(Na_{0,5}Bi_{0,5})^{2+}$-ions and of the Nb^{5+}-ions by V^{5+}-

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

An Investigation of the Dielectric Polarization of the Cadmium Pyroniobate and of Some Solid Solutions on Its Basis. 57-12-4/19

and Ti^{4+}-ions leads to a decrease of the Curie-temperature. In the case of solid solutions of sodium and magnesium-niobate in cadmium pyroniobate a partial substitution of the Cd^{2+}-ions by Na^{1+}- and Mg^{2+}-ions leads to a splitting of the maximum of the curve of $\xi = f(T)$, which apparently is connected with the existence of a phase not characteristic for the cadmium pyroniobate in a certain temperature interval. In the case of polycrystalline samples of cadmium pyroniobate below the Curie-temperature and of solid solutions of sodium-niobate in cadmium pyroniobate in the phase with lower temperature an anomalous dependence of the dielectric polarization on the field strength was observed. Such a dependence is the cause of the anomalous character of the temperature dependence of the complete and spontaneous polarization, and of the coercive force. Three possibilities for the explanation of the anomalous character of the hysteresis loops of cadmium pyroniobate are exhibited here, which are based on the following assumptions: The first possibility is based on the assumption of the existence of two types of domains with different energies of fixation,

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APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

An Investigation of the Dielectric Polarization of the Cadmium Pyroniobate and of Some Solid Solutions on Its Basis.

the second possibility on the assumption of a "ferroelectricity" of the cadmium pyroniobate and on the assumption, that under a influence of a strong electric field the ferroelectric phase transforms into the seignette-electric one. The third possibility is based on the assumption, that the seignette-electric phase of $Cd_2Nb_2O_7$, which exists in the absence of a strong electric field, transforms into the seignette-electric phase with a greater spontaneous polarization on the application of a strong field. Each of these possibilities shows certain deficiencies. The following scientists collaborated in this investigation: Doctor of the Physical-Mathematical Sciences G. A. Smolenskiy, I. G. Ismailzade (X-ray investigations) and A.I. Agranovskaya (technology of the production of samples). There are 13 figures, 1 table, and 7 references, none of which are Slavic.

ASSOCIATION: Institute for Semiconductors AN USSR, Leningrad (Institut poluprowodnikov AN SSSR Leningrad).

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APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

An Investigation of the Dielectric Polarization of the Cadmium Pyroniobate and of Some Solid Solutions on Its Basis. 57-12-4/19

SUBMITTED: April 5, 1957.

AVAILABLE: Library of Congress

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APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

Isupov, V. A.

AUTHOR: SMOLENSKIY G.A., ISUPOV V.A., AGRANOVSKAYA A.I., PA - 3047

TITLE: Phase Transitions in Seignette-Electric Solid Solutions on the Basis of Strontium Pyro Tantalate.
(Fazovyye perekhody v segnetoelektricheskikh tverdykh rastvorakh na osnove pirotantalata strontsiya .Russian)

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol 113, Nr 4, pp 803-805 (U.S.S.R.)
Received 6/1957 Reviewed 7/1957

ABSTRACT: The solid solutions of the seignette electrics of this type investigated up to now are enumerated in short. The present paper investigates other solid solutions of seignette-electric niobates and tantalates and gives some data on the solid solutions in the following systems : $Sr_2Ta_2O_7$ + + $Sr_2Nb_2O_7$, $Sr_2Ta_2O_7$ + $Ba_2Ta_2O_7$ and $Sr_2Ta_2O_7$ + $Ca_2Ta_2O_7$. Hitherto the sample have not been investigated radiographically, but the distinct shifting of CURIE's temperature is indicative of the creation of solid solutions in a limited concentration interval. The samples were produced according to the usual ceramic method and were annealed for one hour at a temperature of 1480°C. An increase of the CURIE temperature of the solid solutions of $Sr_2(Ta,Nb)_2O_7$ was expected on the occasion of the replacement of Ta-ions by Nb-ions. The present paper confirms this expectation, as may be seen from the attached diagrams of the temperature dependence of the dielectricity constant of the solid solutions in the system $Sr_2Ta_2O_7$+$Sr_2Nb_2O_7$. The CURIE temperature increased by about 32° on the occasion of an increase of

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ISOPOV V.A.

AUTHOR SMOLENSKIY G.A., ISUPOV V.A., AGRANOVSKAYA A.I., PA - 3022

TITLE The Solid Solutions of Metaniobate and Metatantalate of Barium in Barium-Titanate which Have Seignette-Electric Properties. (Tverdyye rastvory metaniobata i metatantalata bariya v titanate bariya, obladayushchiye segnetoelektricheskimi svoystvami -Russian)

PERIODICAL Doklady Akademii Nauk SSSR, 1957, Vol 113, Nr 5, pp 1053-1056 (U.S.S.R.)

Received 6/1957 Reviewed 7/1957

ABSTRACT The authors investigated various compound systems $BaTiO_3$ - $Ba_{0,5}NbO_3$ and $BaTiO_3$ - $Ba_{0,5}TaO_3$ with a content (of up to 10 mol.-percent) of $Ba_{0,5}NbO_3$ and $Ba_{0,5}TaO_3$. The polycrystalline samples with a low degree of open porosity were produced in the usual manner. The introduction of barium-metaniobate into the barium titanate modifies the temperature dependence of ε and tg δ considerably. With a content of 1 mol.-% $Ba_{0,5}NbO_3$ the ε-peak vanishes at Curie point and there remains only a salient point in the curve $\varepsilon = f(T)$. If the $Ba_{0,5}NbO_3$ content increases, this salient point becomes less pronounced, and with more than 5 mol-% $Ba_{0,5}NbO_3$ it vanishes entirely. In solid solutions a maximum of ε is found to exist in the domain of the phase transition from the tetragonal to the orthorhombic structure. If the concentration of bariumβmetaniobate increases, the maxima of the curves $\varepsilon = f(T)$ weaker and more washed out, on which occasion they shift towards lower temperatures. The position of the maxima and of the salient points of the curve $\varepsilon = f(T)$ does not depend on frequency in solid solutions. In solid solutions with a high content of barium metaniobate tg δ changes

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The Solid Solution of Metaniobate and Metatantalate of Barium PA - 3082
in Barium-Titanate which Have Seignette-Electric Properties.

only slightly if temperature drops below 110 - 120°. Analogous regular developments are found in the system $BaTiO_3$ - $Ba_{0,5}TaO_3$, but barium metatantalate is less "effective" than barium metaniobate. From the temperature dependence of the dielectricity constant the points of the phase transitions were determined and a diagram of the phase transitions from the cubic phase into the tetragonal phase and from the tetragonal into the orthorhombic phase was constructed. In the systems $BaTiO_3$ - $BaNbO_{3,5}$($BaTaO_{3,5}$) the barium pyroniobate and the barium pyrotantalate exercise a similar effect as barium metaniobate and barium metatantalate. The comparatively slight dependence of the dielectricity constant of the investigated solid solutions on temperature and on the field strength, the lack of volatile components, as well as the low burning temperature make it appear probable that these solid solutions can be put to technical use.
(with 3 illustrations)

ASSOCIATION Institute for Semiconductors of the Academy of Science of the U.S.S.R.
PRESENTED BY IOFFE A.F., Member of the Academy
SUBMITTED 31.7.1956
AVAILABLE Library of Congress
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APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

ISUPOV, V.A.

24(6) 9(3,4) PHASE I BOOK EXPLOITATION SOV/1903

Akademiya nauk SSSR. Institut poluprovodnikov

Poluprovodniki v nauke i tekhnike, t. 2. (Semiconductors in Science and Technology, Vol 2) Moscow, Izd-vo AN SSSR, 1958. 658 p. 17,000 copies printed.

Resp. Ed.: A.F. Ioffe; Tech. Ed.: R.S. Pevzner.

PURPOSE: This collection of articles is intended for scientists, engineers and technicians.

COVERAGE: The collection, published by the Semiconductor Institute, Academy of Sciences, USSR, under the supervision of Academician A.F. Ioffe, contains Parts II and III of a two-volume work on semiconductors. Part II completes the material on semiconductor devices, begun in Volume I, and Part III describes various semiconductor materials. Lack of space did not permit inclusion of such subjects as crystal counters, thermoelectric generators, atomic batteries, luminophores, semiconductor catalyzers, materials for complex cathodes and various other applications of semiconductors. Ioffe points out that the article by the American scientists V. Johnson and K. Lark-Horovitz on semiconductors at low temperatures deals with a subject hardly covered in the Soviet literature. Similarly, the article by the Swiss scientists G. Busch and U. Winkler fills a gap in the Soviet literature on methods of investigating semiconductor characteristics. These subjects will be dealt with exclusively in a proposed third volume. References appear separately after each article.

TABLE OF CONTENTS:

The author discuss the application of ferromagnetic semiconductors in multichannel telephony, radar, electroacoustics, electronic counters, cores of induction coils, transformers and filters, permanent magnets, magnetostriction transducers, memory elements, etc. They explain the crystallography of ferrites and the theoretical fundamentals of noncompensated antiferromagnetism.

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They also discuss problems of magnetic saturation in ferrites and their behaviour in a-c magnetic fields and at very high frequencies. Special chapters cover such subjects as electromagnetic oscillations in ferrites and nonlinear processes occurring at very high frequencies. The concluding chapters deal with the electric properties of ferrites and with ferrite materials and their selection. There are 53 references, of which 33 are English and 20 Soviet.

The authors explain the differences and similarities between seignetoelectric, piezoelectric and ferromagnetic materials. They present a historical survey of seignetoelectricity and provide data tables of seignetoelectric materials. The authors explain the fundamentals of the microscopic theories on seignetoelectric phenomena and discuss in detail the crystal lattice structure, physical properties and problems of producing various seignetoelectric materials. They briefly describe antiseignetoelectric materials and draw attention to recently adopted applications of these materials, e.g., miniature capacitors, nonlinear capacitors, piezoelements and memory elements. There are 35 references, of which 20 are Soviet, 13 English

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

ISUPOV, V. A.

Smolenskiy, G. A., V.A. Isupov, A.I. Agranovskaya and Ye. D. Sholokhova, Leningrad, Institut khimii silikatov AN SSR (Institute for Silicate Chemistry, AS USSR) "Polarization and Dielectric Losses in Several Solid Solutions of the First and Second Classes"

(The Physics of Dielectrics; Transactions of the All-Union Conference on the Physics of Dielectrics) Moscow, Izd-vo AN SSSR, 1958. 245 p. 3,000 copies printed.

This volume publishes reports presented at the All-Union Conference on the Physics of Dielectrics, held in Dnepropetrovsk in August 1956, sponsored by the "Physics of Dielectrics" Laboratory of the Fizicheskiy institut imeni Lebedeva An SSSR (Physics Institute imeni Lebedev of the AS USSR), and the Electrophysics Department of the Dnepropetrovskiy gosudarstvennyy universitet (Dnepropetrovsk State University).

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

AUTHOR: Isupov, V.A. SOV/70-3-1-21/26

TITLE: A Geometrical Criterion of the Pyrochlore Type of Structure (Geometricheskiy kriteriy struktury tipa pirokhlora)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 1, pp 99-100 (USSR)

ABSTRACT: Many compounds with formulae $A'A''B_2O_6X$ crystallize with the pyrochlore type of structure. This type is important because cadmium pyroniobate is ferroelectric. The framework is made up of B_2O_6 octahedra sharing corners, X ions tetrahedrally surrounded by A' and A" ions, O ions surrounded by distorted tetrahedra of 2 B ions and 2 A ions and A ions surrounded each by six O and two X ions in a deformed cube. Tolerance factors relating the ionic radii can be set up:

$$t = 0.433 (R_{A'} + R_{A''} + 2R_X) / (R_B + R_O)$$

$$t_1 = 0.718 (R_{A'} + R_O) / (R_B + R_O)$$

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A Geometrical Criterion of the Pyrochlore Type of Structure

$$t_2 = 0.718 (R_A + R_O) / (R_B + R_O)$$

For $A_2B_2O_7$ compounds these reduce to:

$$t = 0.866 (R_A + R_O) / (R_B + R_O) .$$

The factors t and t_1 are listed for such compounds of appropriate structure as are known. Those with the pyrochlore structure fall mostly into a group with t between 0.94 and 1.06, but for a few compounds t may reach 1.16. The latter are strongly polarized. For all pyrochlore structures t_1 is less than 1 . It seems necessary, but not sufficient that t should be between 0.94 and 1.16 and t_1 and t_2 more than 0.78.

There are 2 figures and 4 references, 1 of which is Soviet and 3 English.

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SOV/70-3-1-21/26

A Geometrical Criterion of the Pyrochlore Type of Structure

ASSOCIATION: Institut poluprovodnikov AN SSSR
(Institute of Semiconductors of the
Ac.Sc.USSR)

SUBMITTED: May 13, 1957

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APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

48-22-3-2/30

AUTHORS: Smolenskiy, G.A., Isupov, V.A., Agranovskaya, A. I., Sholokhova, Ye. D.

TITLE: Polarization and Dielectric Losses in Some Solid Solutions of the First and Second Type. (Polyarizatsiya i dielektricheskiye poteri v nekotorykh tverdykh rastvorakh pervogo i vtorogo roda) Theses of the Lecture. The Complete Article is Published in ZhTF, 1957, Nr 27, p. 2528 and DAN USSR, 1957, Nr 113, pp. 803 and 1053 (Tezisy doklada, Podrobnaya stat'ya opublikovana v ZhTF, Nr 27, p. 2528, 1957, DAN SSSR, Nr 113, pp. 803, 1053 (1957)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 1958, Vol. 22, Nr 3, p. 236 (USSR)

ABSTRACT: 1) The results obtained by the investigation of the polarization and the dielectric losses of polycrystalline samples of some solid solutions of the first and second type are given in the lecture.

2) The results obtained by the investigation of the systems of solid solutions (Sr, Ca)(Ti, Zr)O_3 are given.

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

48-22-3-2/30

Polarization and Dielectric Losses in Some Solid Solutions of the First and Second Type. Theses of the Lecture. The Complete Article is Published in ZhTF, 1957, Nr 27, p. 2528 and DAN USSR, 1957, Nr 113, pp. 803 and 1053

3) The system of the solid solutions $BaTiO_3$——$LaAlO_3$ was investigated.
4) Solid solutions of the first type: $(Sr, Ca)_2Ta_2O_7$, $(Sr, Ba)_2Ta_2O_7$, $Sr_2(Ta, Nb)_2O_7$ were investigated on the basis of strontium-pyrotantalate.
5) The results obtained by the provisional investigation of the solid solutions of the second type are given: $BaTiO_3$—— $BaTa_2O_6$ and $BaTiO_3$——$BaNb_2O_6$.

ASSOCIATION: Institut khimii silikatov Akademii nauk SSSR (Institute of the Chemistry of Silicates, AS USSR)

1. Crystals--Polarization 2. Alloys--Dielectric properties

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

24(3)

AUTHOR: Isupov, V. A.

SOV/48-22-12-24/33

TITLE: On Phase Transitions in Solid Solutions of Sodium Tantalate in Sodium Niobate (Fazovyye perekhody v tverdykh rastvorakh tantalata natriya v niobate natriya)

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1958, Vol 22, Nr 12, pp 1504 - 1507 (USSR)

ABSTRACT: The present paper investigates the phase transitions in the system of solid Na $(Nb,Ta)O_3$ solutions by studying the temperature dependence of dielectric polarization. The samples were produced by the usual ceramic process from previously synthesized $NaNbO_3$ and $NaTaO_3$. The sintering temperature was from 1280 to 1480°. It was established that the high-temperature phase transitions from the cubic into the tetragonal symmetry virtually take place in $NaNbO_3$ and $NaTaO_3$ at the same temperatures. The differences of the Curie (Kyuri) temperature in potassium (or lead) niobate and tantalate are, however, quite considerable. The small differences of

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temperature observed during the mentioned phase transitions can, therefore, apparently be explained by their similarity with the "shrinkage transitions" (perekhody smyatiya). The same can also be said of the phase transition from the tetragonal into the pseudo-tetragonal (orthorhombic) symmetry. This is observed in $NaNbO_3$ and $NaTaO_3$ at $\sim 500^\circ$ and 580°. This explanation is also valid for the transition of $NaTaO_3$ at 480°. Under 480° it is a quasi-ferroelectric in so far as antiparallel and parallel ionic displacements (Ref 11) can be observed in $NaTaO_3$ at room temperature. From the phase diagram (Fig 4) may be observed that $NaTaO_3$ is an anti-piezoelectric only at very low temperatures. The existence of a dielectric hysteresis loop in all investigated compositions including $NaNbO_3$ (except $NaTaO_3$), at -190° allows the supposition that they possess a spontaneously polarized, probably ferroelectric, phase at low temperatures. The disappearance of the

 ε maximum, which corresponds to the antipiezoelectric

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transition, as well as the increase of the low-temperature ε maximum, can be explained either by a narrow range of non-solubility at $0.5 < x < 0.6$ or by a defective structure on account of a too low sintering temperature. Both explanations, however, are questionable. The author thanks G. A. Smolenskiy for his direction and A. I. Agranovskaya for helping prepare the samples. There are 4 figures and 13 references, 5 of which are Soviet.

ASSOCIATION: Institut poluprovodnikov Akademii nauk SSSR (Institute for Semiconductors of the Academy of Sciences, USSR)

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

24(6) SOV/57-28-10-8/40

AUTHORS: Smolenskiy, G. A., Agranovskaya, A. I., Popov, S. N., Isupov, V. A.

TITLE: New Ferroelectric Substances of a Complex Composition (Novyye segnetoelektriki slozhnogo sostava)
II. $Pb_2Fe^{3+}NbO_6$ and Pb_2YbNbO_6 (II. $Pb_2Fe^{3+}NbO_6$ i Pb_2YbNbO_6)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, Vol 28, Nr 10, pp 2152-2153 (USSR)

ABSTRACT: This paper covers an account of the synthetic production of polycrystalline samples of $Pb_2Fe^{3+}NbO_6$ and Pb_2YbNbO_6. They were synthetized by a reaction in solid phase according to conventional powder-metallurgical methods. The Pb_2FeNbO_6 samples were sintered at 950°C, the Pb_2YbNbO_6 at 900°C. It was established by X-ray structural analyses that the compounds produced have a perovskite-structure, the niobium-, ytterbium-, and iron ions occupying octahedric positions. The dielectric constant of Pb_2FeNbO_6 samples passes through a maximum at 112°C. Pronounced dielectric hysteresis loops are found at room temperature. Hence

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

New Ferroelectric Substances of a Complex Composition, SOV/57-28-10-8/40
II. $Pb_2Fe^{3+}NbO_6$ and Pb_2YbNbO_6

$Pb_2Fe^{3+}NbO_6$ is a ferroelectric substance. The maximum of the dielectric constant of Pb_2YbNbO_6, which is small, is found at a much higher value, at 280°C. The curve $\varepsilon = f(T)$ exhibits a kink near 240°C. tg δ equals 0.03 at room temperature and a frequency of 1 kcy. It quickly increases at heating, passing through a not very deep minimum at about 240°C, and increasing again henceforth. The dielectric constant versus temperature function typical of antiferroelectric substances, the absence of a hysteresis loop and the sufficiently small geometric criterion t ($t \simeq 0.93$) substantiate the assumption that Pb_2YbNbO_6 is an antiferroelectric substance. There are 1 figure and 2 references, 2 of which are Soviet.

SUBMITTED: May 8, 1958

Card 2/2

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

New Ferroelectric Substances of a Complex Composition. II. $Pb_2Fe^{3+}NbO_6$ and Pb_2YbNbO_6 SOV/57-28-10-8/40

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

24(6)
AUTHORS: Isupov, V. A., Kosyakov, V. I. SOV/57-28-10-12/40

TITLE: Dielectric Polarization and the Piezoelectric Properties of Ferroelectric Solid Solutions of Calcium-, Strontium- and Barium Metaniobates in Lead Metaniobate (Dielektricheskaya polyarizatsiya i p'yezoelektricheskiye svoystva segneto-elektricheskikh tverdykh rastvorov metaniobatov kal'tsiya, strontsiya i bariya v metaniobate svintsa)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, Vol 28, Nr 10, pp 2175 - 2185 (USSR)

ABSTRACT: This is an investigation of the dependence of the Curie-temperature of polycrystalline samples of solid solutions of calcium metaniobates in lead metaniobate upon the content of calcium metaniobate. The authors used samples of the system lead metaniobate - barium metaniobate - strontium metaniobate (which were produced for the work covered by reference 5, that paper also presenting a description of the method of production). Summary: 1) Solid solutions of calcium metaniobate in lead metaniobate are produced at a content of $CaNb_2O_6$ of not less than

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40 molar %. The Curie-point of these solid solutions decreases in the range of 0-20% of calcium metaniobate content, whereas it remains constant in the range of 20-40% of calcium metaniobate. The dielectric constant of the solid solutions in question is relatively small. 2) The degree of spontaneous polarization exhibited by polycrystalline samples of some solid solutions is very high as compared to that of polycrystalline samples of barium titanate, indicating a pronounced tendency of lead metaniobate towards spontaneous polarization. When measurements were conducted with samples of a 40% content of $BaNb_2O_6$ a value of the spontaneous polarization of 21 micro-Coulomb/cm^2 was obtained. 3) The curves of the temperature dependence of the resonance frequency of solid solutions of strontium metaniobate in lead metaniobate exhibit a kink at negative temperatures. The maxima of the characteristics of the piezoelectric properties of the mixtures in question are found in the vicinity of this temperature. 4) The solid solutions

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

Dielectric Polarization and the Piezoelectric Properties of Ferroelectric Solid Solutions of Calcium-, Strontium- and Barium Metaniobates in Lead Metaniobate

SOV/57-28-10-12/40

of barium and strontium metaniobate exhibit high piezoelectric properties. Several of the piezoelectric characteristics of a number of mixtures are stable in a wide temperature range. There are 9 figures and 9 references, 7 of which are Soviet.

SUBMITTED: May 10, 1958

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

ISUPOV, V. A. Cand Phys-Math Sci -- (diss) "Seignette-electric properties of certain niobates and tantalates." Len, 1959. 14 pp (Acad Sci USSR. Phys Inst im P. N. Lebedev), 245 copies. List of author's works at end of text (15 titles) (KL, 49-59, 137)

APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

SMOLENSKIY, G.A.; ISUPOV, V.A.; AGRANOVSKAYA, A.I.

New group of seignettoelectrics with a laminated structure. Fiz. tver.tela 1 no.1:169-170 Ja '59. (MIRA 12:4)
(Ferroelectric substances)

APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

SMOLENSKIY, G.A.; ISUPOV, V.A.; AGRANOVSKAYA, A.I.

New seignettoelectics of complex composition of the type $A_2^{+2}(B_I^{+3}B_{II}^{+5})O_6$
Part 1. Fiz.tver.tela 1 no.1:170-171 Ja '59. (MIRA 12:4)
(Ferroelectric substances)

APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

ISUPOV, V.A.

Seignettoelectric properties of lead metatantalate. Fiz. tver. tela 1 no.2:242-245 F '59. (MIRA 12:5)
(Lead tantalates--Electric properties) (Ferroelectricity)

APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

SMOLENSKIY, G.A.; ISUPOV, V.A.; AGRANOVSKAYA, A.I.

Seignetteelectric properties of solid solutions in the system $PbNb_2O_6$ - $BaNb_2O_6$ - $SrNb_2O_6$. Fiz. tver. tela 1 no.3:442-449 Mr '59. (MIRA 12:5)

1. Institut poluprovodnikov AN SSSR, Leningrad.
(Solutions, Solid) (Curie point) (Ferroelectric substances)

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

ISUPOV, V.A.; KOSYAKOV, V.I.

Dielectric polarization and piezoelectric properties of some seignettoelectric solid solutions made from sodium niobate. Fiz. tver. tela 1 no.6:929-934 Je '59. (MIRA 12:10)

1.Institut poluprovodnikov AN SSSR, Leningrad.
(Sodium niobate) Ferroelectric substances)

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

SMOLENSKIY, G.A.; AGRANOVSKAYA, A.I.; ISUPOV, V.A.

New seignettoelectrics of complex composition. Part 3: Pb_2MgWO_6; $Pb_3Fe_2WO_9$, Pb_2FeTaO_6. Fiz. tver. tela 1 no.6:990-992 Je '59. (MIRA 12:10)

1. Institut poluprovodnikov Akademii nauk SSSR, Leningrad.
(Ferroelectric substances)

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

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SOV/181-1-10-12/21

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AUTHORS: Smolenskiy, G. A., Isupov, V. A., Agranovskaya, A. I.

TITLE: Ferroelectric Solid Solutions of Substitution With Subtraction

PERIODICAL: Fizika tverdogo tela, 1959, Vol 1, Nr 10, pp 1573 - 1582 (USSR)

ABSTRACT: In order to complement publications by many Western authors and the Soviet scientists Skanavi and Ksendzov, the authors studied the ferroelectric properties of the following systems: $BaTiO_3$-$Ba_{0.5}NbO_3$; $BaTiO_3$-$Ba_{0.5}TaO_3$; $BaTiO_3$-$La_{2/3}TiO_3$; $BaTiO_3$-BaO:NiO; $BaTiO_3$-WO_3; $BaTiO_3$-BaO:$AlO_{1.5}$; $BaTiO_3$-$NaTiO_{2.5}$. The samples were prepared by the usual ceramic methods. For burning temperatures of the samples see table 1. The temperature dependence of the ϵ- and tgδ-values for the individual systems is graphically illustrated in figures 1,2,4, 5, 6 and 10. Figure 3 shows the temperature dependence of phase transformations occurring in the solid solutions of the systems $BaTiO_3$-$La_{2/3}TiO_3$ and $BaTiO_3$-$LaAlO_3$. The temperature dependence

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of the specific elongation of the solid solutions of $BaTiO_3$-$Ba_{0.5}$-NbO_3 is depicted in figure 8. Figure 7 represents the dielectric hysteresis loops of the solid solution of the system $BaTiO_3$-$Ba_{0.5}NbO_3$ as dependent on the $BaNbO_3$ content. Figure 9: temperature dependence of the dielectric constant of the solid solutions of the system $BaTiO_3$-$Ba_{0.5}NbO_3$ as dependent on the $Ba_{0.5}NbO_3$ concentration. Final digest: 1) The ferroelectric solid solutions of substitution with subtraction may be divided into two groups: a) In the first group the maximum of the dielectric constant at the Curie point is retained even if the solid solution contains a high percentage of the second component. b) The maximum of the dielectric constant of the second group is suppressed already by a small percentage of the second component. The first group includes the solid solutions of $La_{2/3}TiO_3$ in $BaTiO_3$, whereas the solid solutions of $Ba_{0.5}NbO_3$, $Ba_{0.5}TaO_3$, and BaO:NiO in $BaTiO_3$ belong to the second group. 2) The properties

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Ferroelectric Solid Solutions of Substitution With Subtraction SOV/181-1-10-12/21

of the solid solutions (second group) of substitution with subtraction may be explained by the perturbing effect of electrons and holes located near the vacancies of the crystal lattice. The first report on this investigation was delivered at the All-Union Conference on Ferroelectricity held at Rostov-na-Donu in 1957. The Soviet scientists Yu. N. Venevtsev, A. F. Ioffe, Devyatkova, and Stil'bans are quoted in this article. There are 10 figures, 1 table, and 9 references, 4 of which are Soviet.

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute for Semiconductors of the AS USSR, Leningrad)

SUBMITTED: August 18, 1958

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

SOV/70-4-4-23/34

AUTHOR: Isupov, V.A.

TITLE: Phase Transitions Involving Puckering

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 4, pp 603-608 (USSR)

ABSTRACT: The nature of the phase transitions in $CaTiO_3$, zirconates, stannates, calcium and strontium cerates, etc. is discussed. The possible distributions of electric moments of pseudo-cubic unit cells below the transition temperatures are examined, distinctions being made between puckering phase transitions and ferroelectric transitions. Many examples of actual substances are considered and analysed in their packing and it is found essential to distinguish between ferroelectric, antiferroelectric and ferrielectric transitions and puckering transitions. The latter can lead to a different distribution of the electric moments of pseudo-cubic unit cells. It should also be noted that phase transitions, known usually as ferro- or antiferro-electric, may in fact be intermediate between ferro- or antiferroelectric and puckering transitions. Puckering transitions were defined by Francombe and Lewis (Ref 11)

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Phase Transitions Involving Puckering SOV/70-4-4-23/34

and occur in the $(Na,K)NbO_3$, $(Na,Pb_{0.5})NbO_3$ and $(Na,Cd_{0.5})NbO_3$ solid solutions.

New data on $Sr_2Ta_2O_7$ are given. There are 4 figures.

There are 17 references, of which 8 are Soviet, 5 English, 1 Rumanian and 3 international.

ASSOCIATION: Institut poluprovodnikov AN SSSR (Institute of Semiconductors of the Ac.Sc., USSR)

SUBMITTED: June 26, 1958

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PHASE I BOOK EXPLOITATION SOV/4379

Vsesoyuznaya konferentsiya po fizike dielektrikov. 2d, 1958

Fizika dielektrikov; trudy vtoroy vsesoyuznoy konferentsii (Physics of Dielectrics; Transactions of the 2d All-Union Conference on the Physics of Dielectrics) Moscow, Izd-vo AN SSSR, 1960. 532 p. Errata slip inserted. 5,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Fizicheskiy institut imeni P.N. Lebedeva.

Ed. of Publishing House: Ye.L. Starokadomskaya; Tech. Ed.: I.N. Dorokhina; Editorial Board: (Resp. Ed.) G.I. Skanavi, Doctor of Physics and Mathematics (Deceased), and K.V. Filippova, Candidate of Physics and Mathematics.

PURPOSE: This collection of reports is intended for scientists investigating the physics of dielectrics.

COVERAGE: The Second All-Union Conference on the Physics of Dielectrics held in Moscow at the Fizicheskiy institut imeni P.N. Lebedeva (Physics Institute imeni P.N. Lebedev) in November 1958 was attended by representatives of the principal scientific centers of the USSR and of several other countries. This collection contains most of the reports presented at the conference and summaries of the discussions which followed. The reports in this collection deal with dielectric properties, losses, and polarization, and with specific inductive capacitance of various crystals, chemical compounds, and ceramics. Photoelectrets, ferroelectric crystals, and various radiation and irradiation effects on dielectrics are investigated. The volume contains a list of other papers presented at the conference dealing with polarization, losses, and breakdowns of dielectrics, which were published in the journal Izvestiya AN SSSR, seriya fizicheskaya, Nos. 1 and 2, 1960. No personalities are mentioned. References accompany each report.

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Isupov, V.A.

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S/181/60/002/011/032/042
B006/B060

24,7800 (1035, 1142, 1162)

AUTHORS: Smolenskiy, G. A., Isupov, V. A., Agranovskaya, A. I., and Popov, S. N.

TITLE: Ferroelectrics With Blurred Phase Transitions

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 11, pp. 2906-2918

TEXT: This is the reproduction of a lecture delivered at the All-Union Conference on Ferroelectricity which took place in Moscow in January, 1960. A report was made on studies conducted on polycrystalline specimens of ferroelectrics with blurred phase transition and belonging to the two systems $Pb(Mg_{1/3}Nb_{2/3})O_3$ - $Pb(Ni_{1/3}Nb_{2/3})O_3$ and $Ba(Nb, Ta)_2O_6$ - $Sr(Nb,Ta)_2O_6$. These ferroelectrics exhibit a relaxation polarization in the region of phase transition. The technique of the specimen preparation has already been described by A. I. Agranovskaya (Ref. 6), and the method of measurement in Ref. 2. Investigation results are illustrated in diagrams and are discussed in great detail. Fig. 1 shows ε and $\tan\delta$ as functions of temperature for $Pb(Ni_{1/3}Nb_{2/3})O_3$ in weak fields at frequencies between 1 and

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Ferroelectrics With Blurred Phase Transitions S/181/60/002/011/032/042
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1500 kc. Both curve groups exhibit a maximum between -150 and -100°C, the precise position and height of which is somewhat frequency-dependent. The maximum loss angle is the larger the higher the frequency. Fig. 2 shows the temperature dependence of ε and $\tan\delta$ on $Pb(Mg_{1/3}Nb_{2/3})O_3$ in weak fields at frequencies between 0.4 and 4500 kc. This compound as well exhibits loss angle maxima, lying between -50 and 0°C and which are the higher, the higher the frequency. The ε-maxima (between 9000 and 12000) are the higher, the lower the frequency. At 0.4, 1, and 45 kc they still lie at negative temperatures, but already at positive ones at 450, 1500, and 4500 kc. The ascending part of the $\varepsilon(t)$ curves is frequency dependent, but not so the dropping part. Figs. 3 and 4 show oscillograms of the hysteresis loops of these two compounds at -90 and -196°C, respectively, taken at varying electric field strengths (E_{max} = 20 kv/cm and 60 kv/cm). Fig. 5 shows the temperature dependence of total polarization on $Pb(Mg_{1/3}Nb_{2/3})O_3$, $Pb(Ni_{1/3}Nb_{2/3})O_3$, and solid solutions $xPb(Mg_{1/3}Nb_{2/3})O_3 + (1-x)Pb(Ni_{1/3}Nb_{2/3})O_3$, the x-values being given near the curves. Fig. 6 shows, for these specimens, the spontaneous polarization as a temperature function, Fig. 7 the

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Ferroelectrics With Blurred Phase Transitions S/181/60/002/011/032/042
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temperature dependence of the resonance frequencies of radial vibrations, of the elasticity and piezoelectric modulus, and Fig. 8 the temperature dependence of the linear expansion coefficient. Fig. 9 again shows ε and $\tan\delta$ as a temperature function for the solid solutions (like Fig. 5), the numbers near the curves again denoting x. Fig. 10 illustrates the relative change in the specimen lengths (solid solutions) as a temperature function for different x and Fig. 11 ε and $\tan\delta$ as a function of temperature for solid $Ba_{0.5}Sr_{0.5}(Nb_xTa_{1-x})_2O_6$ solutions. Fig. 13 shows the same for $Ba(Ti_{0.7}Sn_{0.3})O_3$. It is concluded from the results obtained that the blurred phase transitions observable in a large group of ferroelectrics can be explained by the submicro-inhomogeneous structure of these substances. The relaxation polarization is believed to be due to a shift of the domain boundaries in weak fields. G. A. Skanavi, V. A. Bokov, I. Ye. Myl'nikova, S. M. Ariya, V. Ya. Fritsberg, E. Zh. Freydenfel'd, and Ya.Ya. Kruchan are mentioned. There are 13 figures and 16 Soviet references.

ASSOCIATION: Institut poluprovodnikov AN SSSR Leningrad (Institute of Semiconductors of the AS USSR, Leningrad)

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9,2181 (also 1162)

AUTHORS: Smolenskiy, G. A., Isupov, V. A., Agranovskaya, A. I., and Kraynik, N. N.

TITLE: New Ferroelectrics of a Complicated Composition. IV

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 11, pp. 2982-2985

TEXT: This is a report on the discovery of new perovskite-type ferroelectrics, which may be described by the empirical formulas $[Bi_{0.5}Na_{0.5}]TiO_3$ and $[Bi_{0.5}K_{0.5}]TiO_3$. The Curie temperatures of these compounds are 320° and 380°C, respectively. The compounds were prepared by mixing the initial substances Bi_2O_3, TiO_2, K_2CO_3, and Na_2CO_3 in a stoichiometric ratio, and by sintering them in the air at 1120-1140 (Bi-Na) and 1060°C (Bi-K) for an half an hour to two hours. The perovskite structure of the compounds thus obtained was established by X-rays. The parameters of the elementary cells of the two compounds were found to be a = 3.88 and 3.94 A, respectively. In the said compounds, the authors determined ε, $\tan\delta$,

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New Ferroelectrics of a Complicated Composition. IV

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the relative longitudinal expansion $\Delta l/l$ and the coefficient of linear expansion α as temperature functions. Results are shown in Figs. 1 and 2. A study of polarization revealed that sodium bismuth titanate has a well-shaped almost rectangular hysteresis loop, whereas that of potassium bismuth titanate is far from saturation. The first mentioned compound has at 116°C a spontaneous polarization of 8.0 μ coul/cm^2 and a coercive force of 14 kv/cm. It was further established that also $[Na_{0.5}Bi_{0.5}]ZrO_3$ and $[K_{0.5}Bi_{0.5}]ZrO_3$ have a perovskite-type crystallization. There are 2 figures and 18 references: 15 Soviet, 1 US, and 2 British.

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute of Semiconductors of the AS USSR, Leningrad)

SUBMITTED: June 30, 1960

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S/048/60/024/010/024/033
B013/B063

AUTHORS: Isupov, V. A., Agranovskaya, A. I., and Khuchua, N. P.

TITLE: Some Physical Properties of Piezoelectric Lead Ferroniobate and Lead Ferrotantalate

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1960, Vol. 24, No. 10, pp. 1271-1274

TEXT: The authors studied some physical properties of Pb_2FeNbO_6 (Ref. 3) and Pb_2FeTaO_6 (Ref. 4). The samples were produced by the ceramic process. Fig. 1 gives the temperature dependence of ε and $\tan\delta$ at a frequency of 1 kilocycle. It may be seen that lead ferroniobate in weak fields shows a maximum at 110°C and lead ferrotantalate at -25°C. These maxima correspond to the dielectric phase transitions. Below the Curie point, the dielectric polarization of the two compounds is a non-linear function of the electric field strength (cf. Fig. 2). At temperatures near the temperature of the ε-maxima, the curves $\Delta l/l = f(T)$ exhibit distinctly marked peaks which are related to the piezoelectric phase transitions (cf. Fig. 3). At equal

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Some Physical Properties of Piezoelectric Lead Ferroniobate and Lead Ferrotantalate

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temperatures, the coefficients of linear expansion attain minima. The authors' studies proved the existence of Pb_2FeNbO_6 and Pb_2FeTaO_6 with a structure of the perovskite type and piezoelectric properties. The spontaneous polarization of polycrystalline samples of these compounds is obviously less than that of barium titanate. Lead ferroniobate and lead ferrotantalate have also a positive volume electrostriction. Unlike barium titanate, they exhibit no low-temperature phase transitions, at least not down to -190°C. The piezoelectric modulus d_{31} of polycrystalline samples of lead ferroniobate is very similar to that of $BaTiO_3$. Their electrical conductivity is much higher than that of $BaTiO_3$. Samples of lead ferroniobate exhibit a high susceptibility. The authors thank G. A. Smolenskiy for his interest in the work. The present paper was read at the Third Conference on Piezoelectricity, which took place in Moscow from January 25 to 30, 1960. There are 3 figures and 5 Soviet references.

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S/181/61/003/003/022/030
B102/B205

9.4300 (1136, 1145, 1147, 1153)

AUTHORS: Smolenskiy, G. A., Isupov, V. A., and Agranovskaya, A. I.

TITLE: Laminated ferroelectrics of the oxygen-octahedron type

PERIODICAL: Fizika tverdogo tela, v. 3, no. 3, 1961, 895-901

TEXT: In an earlier paper (Ref. 1: FTT, I, 1, 169, 1959), the authors have uttered the opinion that compounds of the general formula $ABi_2B_2O_9$ ($A = Ca^{2+}$, Sr^{2+}, Ba^{2+}, Pb^{2+}, Bi^{3+}; $B = Ti^{4+}$, Nb^{5+}, Ta^{5+}) have ferroelectric properties. Now they report on the proof of these properties and the manufacture of the new group of ferroelectrics. In the lattice of these compounds, perovskite-type layers $(AB_2O_7)^{2-}$ consisting of BO_6 octahedra alternate with $\left[(Bi_2O_2)^{2+}\right]_x$ layers. Such crystals have face-centered, orthorhombic unit cells which, in first approximation, are considered to be body-centered tetragonal cells. The specimens (8-10 mm diameter, 0.5-2 mm thickness) were made of powdered oxides or salts of the corresponding metals: PbO, $SrCO_3$, $BaCO_3$, Bi_2O_3 trade-marked "чда" (pro analysi), $CaCO_3$, TiO_2

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trade-marked "ч" (pure), Nb_2O_5 (containing Nb 99.4%, Ta 0.2%, Fe 0.06%, Si 0.04%), and Ta_2O_5 (TiO_2 < 0.25%, Fe_2O_3 0.18%). The specimens were pressed from the powder mixtures, heated to 700°C (for 4 hr) in air, again powdered and heated to temperatures which are listed in Table 1 (holding time: 1 hr). The losses in weight (in lead and bismuth oxides) are given in %. The X-ray structural analysis was carried out by I. G. Ismailzade. The temperature dependence of the initial values of ε for some of the compounds is shown in Figs. 2 and 3; the course of ε(T) on heating and cooling is shown for $PbBi_2Nb_2O_9$. tan δ of these compounds at 1 kc and room temperature was equal to 0.01. It is seen that some compounds show a monotonic increase of ε without an extremum, while other compounds have broad or sharp maxima. The highest value of ε is reached by $BaBi_4Ti_4O_{15}$. Fig. 4 shows the temperature dependence of ε and tan δ of the solid solutions $(Pb_{1-x}Ba_x)Bi_2Nb_2O_9$ at 1 kc, and of the compound $BaBi_2Nb_2O_9$ at 1 kc (continuous line) and 450 kc (broken line). The figures beside the curves are the values of x. Fig. 5 shows the x-dependence of the temperature at which

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ε reaches its maximum for $(Pb_{1-x}Ba_x)Bi_2Nb_2O_9$ at 1kc (1) and 450 kc (2), and for $(Pb_{1-x}Sr_x)Bi_2Nb_2O_9$ at 500 kc (3). The chemical composition (1) and the temperatures of the phase transition (2) of niobates (a), tantalates (b), and titanates (c) studied are listed in Tables 2 and 3. It may be seen that all compounds of the new group of ferroelectrics have a comparatively high phase-transition temperature. This fact is attributed to the presence of Bi^{3+} ions. Concerning the selection of the ions A and B, it is necessary to follow the instruction given in Ref. 8 (G. A. Smolenskiy and A. I. Agranovskaya, FTT, I, 10, 1562, 1959) for the manufacture of such ferroelectrics. The fact that the radii of the ions A^{2+} and Bi^{3+} vary considerably is held responsible for the disturbance of the arrangement of the cations forming the compound $CaBi_2Nb_2O_9$ in several compounds with a laminated structure. This explains the width of the phase transition (blurredness) and the occurrence of relaxation polarization in $BaBi_2Nb_2O_9$. There are 5 figures, 3 tables, and 8 references: 7 Soviet-bloc and 1 non-Soviet-bloc.

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B102/B205

Laminated ferroelectrics ...

ASSOCIATION: Institut poluprovodnikov AN SSSR Leningrad (Institute of Semiconductors, AS USSR, Leningrad)

SUBMITTED: July 27, 1960

Legend to Table 1:
1) Composition.
2) Temperature of the last heat treatment. 3) Loss in weight.

Состав (1)	Температура отжигающего обжига, °С (2)	Потеря веса, % (3)	Состав (1)	Температура отжигающего обжига, °С (2)	Потеря веса, % (3)
$CaBi_2Nb_2O_9$	1180	0.4	$PbBi_2Ta_2O_9$	1050	0.4
$SrBi_2Nb_2O_9$	1180	0.0	$Bi_4Ti_3O_{12}$	920	—
$BaBi_2Nb_2O_9$	1130	0.3	$SrBi_4Ti_4O_{15}$	1200	—
$PbBi_2Nb_2O_9$	1000	0.0	$BaBi_4Ti_4O_{15}$	1150	—
$BiBi_2NbTiO_9$	1150	—	$PbBi_4Ti_4O_{15}$	1100	—
$BaBi_4Ti_4O_{15}$	1120	—	$(Pb, Sr)Bi_2Nb_2O_9$	1150	—
$CaBi_2Ta_2O_9$	1180	—	$(Pb, Ba)Bi_2Nb_2O_9$	1100	1%
$SrBi_2Ta_2O_9$	1060	0.74	$(Ba, Ca)Bi_2Nb_2O_9$	1150	—
$BaBi_2Ta_2O_9$	1150	3.7	$(Ba, Sr)Bi_2Nb_2O_9$	1150	—

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24.7800 (1043, 1145, 1035)
24.2200 1144, 1147, 1158,

30060
S/048/61/025/011/004/031
B108/B138

AUTHORS: Smolenskiy, G. A., Isupov, V. A., Kraynik, N. N., and Agranovskaya, A. I.

TITLE: Coexistence of the ferroelectric and ferrimagnetic states

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya, v. 25, no. 11, 1961, 1333-1339

TEXT: This paper was read at the Conference on ferromagnetism and antiferromagnetism in Leningrad, May 5-11, 1961. The authors studied substances having both ferroelectric and ferromagnetic or antiferromagnetic properties. Among the crystals known so far only the perovskite-type structures include a greater number of ferroelectrics and substances with magnetic ordering. If a perovskite-type crystal ABO_3 contains a definite concentration of ions of transition elements with non-compensated spins, magnetic ordering may arise. Ferromagnetic properties will arise when the A and B ions have high polarizability. In perovskite-type crystals, ferrimagnetism may be achieved by a certain ordering of the ions in the B sublattice in solid solutions. The latter are assumed to have the structure

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Coexistence of the ferroelectric and...

$(1-x)A'B'O_3 - xA''B_{0.5}''B_{0.5}'''O_3$ where the first compound is antiferromagnetic and the second paramagnetic. x denotes the concentration of the second component (mole per cent). The saturation magnetic moment of one ABO_3 unit is calculated under the assumption that the exchange interaction within the B sublattices may be neglected. It was found as

$m_s = 0.5(m_I - m_{II}) = 0.5\{[m'(1-x) + m''x][1 - E(k_{II})] - m'(1-x)[1 - E(k_I)]\}$.

m_I and m_{II} are the magnetic moments of sublattices I, II, respectively, m' and m'' the moments of the ions B' and B'', k_I and k_{II} the contributions of nonmagnetic ions to the overall ion number in the sublattices I and II, $E(k) = 6k^5 - 5k^6$ is the probability that a magnetic ion in one of the sublattices has not more than one nearest neighbor among the magnetic ions in the other sublattice. In the considered case, $k_I = 0$ and $k_{II} = x$. In particular the authors studied the solid solution $(1-x)Pb(Fe_{2/3}W_{1/3})O_3 - xPb(Mg_{1/2}W_{1/2})O_3$ which was obtained by sintering the oxides at 900-920°C. X-ray phase analyses were carried out by

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Coexistence of the ferroelectric and...

M. F. Bryzhina. At x concentrations of between 0 and 0.88, the solid solution was ferroelectric. A dielectric hysteresis loop was observed at the temperature of ferroelectric phase transformation. At concentrations above 0.88, the solid solution proved to be antiferroelectric. Fig. 3 shows the magnetic moment of the solid solution at $x = 0.3$ plotted against magnetic field strength. The spontaneous moment m_s was determined from these curves by means of the relation $m = m_s + \chi H$. A "range" rather than a "point" of phase conversion was observed. The exchange interaction energy, and consequently also the Curie temperature, are proportional to the number of interacting Fe-O-Fe pairs per "active" iron ion. In perovskite, this number of interactions is $n(k_I, k_{II}) = (1 - k_I)\left[1 - E(k_{II})\right](1 - k_{II})\left[1 - E(k_I)\right]$. The number of magnetic ions participating in ferrimagnetism is $N = 0.5\left\{(1 - k_I)\left[1 - E(k_{II})\right] - (1 - k_{II})\left[1 - E(k_I)\right]\right\}$. The Curie temperature can be calculated from these relations: $\Theta_M(k_I, k_{II}) = \frac{n(k_I, k_{II})}{N} \cdot \Theta_M(0,0)$, where $\Theta_M(0,0)$ is the

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Coexistence of the ferroelectric and...

Neel temperature of the substance containing no nonmagnetic ions. Experimental and theoretical results agree well. The calculated magnetic moment is too high, which indicates that the magnetic ordering of the ions is not complete. There are 4 figures, 1 table, and 9 references: 4 Soviet and 5 non-Soviet. The three most recent references to English-language publications read as follows: Orgel L. E., J. Chem. Soc., no. 12, 3815 (1959); Gilleo M. A., J. Phys. Chem. Solids, 13, 33 (1960); Fang P. H. et al., Bull. Amer. Phys. Soc., ser. II, 5, no. 1, part 1, 57 (1960).

ASSOCIATION: Institut poluprovodnikov Akademii nauk SSSR (Institute for Semiconductors of the Academy of Sciences USSR)

Card 4/4

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

S/181/63/005/001/029/064
B102/B186

AUTHOR: Isupov, V. A.

TITLE: The causes of the smeared-out phase transition and of the relaxation-type character of the dielectric constant in certain ferroelectrics

PERIODICAL: Fizika tverdogo tela, v. 5, no. 1, 1963, 187 - 193

TEXT: Ferroelectrics with a smeared-out phase transition are characterized by several pecularities; e.g. the positions of the maxima of $\varepsilon(T)$ and $\tan\delta = f(T)$ are frequency-dependent and at the Curie point, where $\varepsilon = \varepsilon_{max}$, the spontaneous polarization decreases but does not vanish - as it does with ordinary ferroelectrics. The author discusses most of the material published in recent years on these ferroelectrics and tries to explain the peculiarities observed. The smeared-out phase transition, i.e. the presence of a Curie range instead of a point, can be explained by microinhomogeneities in composition due to random fluctuations in the ionic distribution over the lattice sites. In the case of solid solutions also ion segregation has to be taken into account. Any ordering reduces the

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

S/181/63/005/003/043/046
B102/B180

AUTHORS: Isupov, V. A., and Skubitskiy, V. N.

TITLE: Elastic and piezoelectrical properties of cadmium pyroniobate in strong electric fields

PERIODICAL: Fizika tverdogo tela, v. 5, no. 3, 1963, 957-959

TEXT: $Cd_2Nb_2O_7$ is the only ferroelectric known at present with pyrochlorine structure. It has already been found that the ε-maximum at -80 - -90°C does not correspond to a Curie point but to a phase transition (cubic at room temperature, pseudocubic below this). Furthermore, $\varepsilon(T)$ displays inflection points at -68, -47, and -12°C. To test the reality of these phase transitions the elastic and piezoelectrical properties of disc single crystals were determined by Mason's dynamic method with a constant displacement field E applied to the specimen. At E=0 the $\varepsilon(T)$ maximum was between -84 and -97°C. At the temperature Θ_2 (10 - 12° above the temperature maximum Θ_1 of $\varepsilon(T)$)

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the curves had a step. At the $\varepsilon(T)$-maximum the s(T) curves have a sharp minimum (cf. Fig. 1; s is Young's modulus). When E is raised from 7 to 9 kv/cm the depth of the s(T) troogh decreases and then increases again; with rising E, s_{min} shifts to lower temperatures, at E=18.5 kv/cm this shift causes an inflection point. This minimum is connected with the low-temperature (-118°C) field dependence of the dielectric hysteresis. At lower fields (~22 kv/cm) the hysteresis looks like that of a ferroelectric, at ~44 kv/cm the rate of polarization rise increases, and at 60 kv/cm a second saturation may be observed. The s(T) minimum may thus be brought into relation with a transition from a state with low to one with high spontaneous polarization. The piezomodulus d_{31} at E=1 kv/cm and -150°C, is $-0.35 \cdot 10^{-6}$ CGSE; near θ_1 it is $-1.2 \cdot 10^{-6}$ CGSE. There are 2 figures.

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute of Semiconductors AS USSR, Leningrad)

SUBMITTED: November 17, 1962

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Elastic and piezoelectrical ...

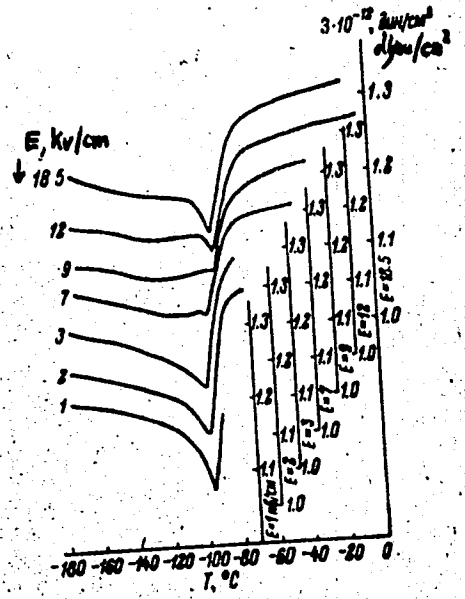

Fig. 1

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45678

S/070/63/008/001/018/024
E132/E460

24.7100

AUTHORS: Isupov, V.A., Agranovskaya, A.I., Bryzhina, M.F.

TITLE: Crystallochemical characteristics and certain physical properties of compounds with the structure of the hexagonal tungsten oxygen bronzes

PERIODICAL: Kristallografiya, v.8, no.1, 1963, 108-110

TEXT: In the perovskite structure there are canals of square cross-section, in the tetragonal potassium tungsten bronzes canals of tetragonal and pentagonal cross-section and in the hexagonal rubidium tungsten bronzes large canals of hexagonal cross-section. In each case the carcase is made up of linked WO_6 octahedra. In the latter structure the alkali ions (A) are 12-coordinated by oxygen at a distance p, 6-coordinated by oxygen at a distance q, and 2-coordinated by other A ions. This gives a total coordination of 20. These three conditions demand that the A ions should have radii 1.732 R_o, 1.449 R_o and 1.414 R_o so these conditions cannot be satisfied simultaneously except by a reformable ion. To enter into this structure an A ion must be sufficiently big, must be sufficiently deformable and must not be highly charged. The following compounds have been found:

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

BR

ACCESSION NR: AP4019340 S/0181/64/006/003/0790/0795

AUTHORS: Isupov, V. A.; Strelets, P. L.; Serova, I. A.; Yatsenko, N. D.; Shirobokikh, T. M.

TITLE: Peculiarities of ferroelectric phase transitions in solid solutions of the system $Na_{0.5}Bi_{0.5}TiO_3$ -- $PbTiO_3$

SOURCE: Fizika tverdogo tela, v. 6, no. 3, 1964, 790-795

TOPIC TAGS: ferroelectric, phase transition, solid solution, Vegard law, dielectric polarization, crystal lattice structure

ABSTRACT: The authors' study stems from lack of information on the effect of diffusion of phase transitions on ferroelectric properties and from disagreement concerning the causes of the relaxation nature of dielectric polarization observed in ferroelectrics with diffused phase transitions. While investigating the dielectric properties and crystal structure in the system $Na_{0.5}Bi_{0.5}TiO_3$--$PbTiO_3$, the authors discovered a number of relationships. Their studies confirm the view that the diffusion of ferroelectric phase transitions declines with

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ACCESSION NR: AP4019840

increase in spontaneous polarization and spontaneous deformation of the solid solutions. At room temperature, the boundary between rhombohedral and tetragonal phases lies in the region of 0-10% $PbTiO_3$. The dependence of unit-cell volume on component concentrations deviates considerably from the Vegard law. The Curie point of the examined solid solutions depends in nonlinear fashion on the concentration of $PbTiO_3$, reaching a minimum at a content of about 10 mol/% . Orig. art. has: 4 figures and 1 table.

ASSOCIATION: none

SUBMITTED: 09Sep63	DATE ACQ: 31Mar64	ENCL: 00
SUB CODE: SS	NO REF SOV: 013	OTHER: 002

Card 2/2

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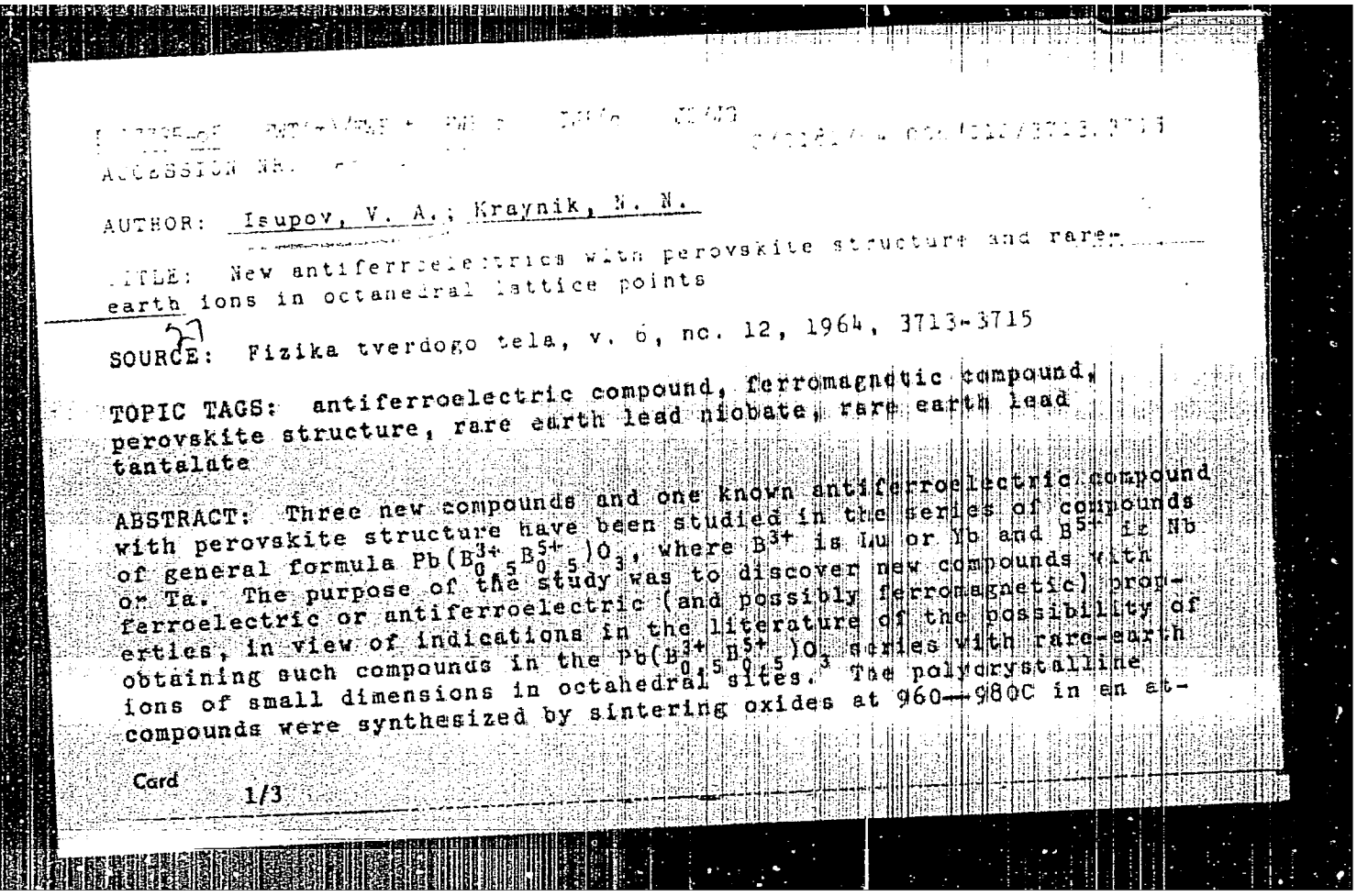

ACCESSION NR.

AUTHOR: Isupov, V. A.; Kraynik, N. N.

TITLE: New antiferroelectrics with perovskite structure and rare-earth ions in octahedral lattice points

SOURCE: Fizika tverdogo tela, v. 6, no. 12, 1964, 3713-3715

TOPIC TAGS: antiferroelectric compound, ferromagnetic compound, perovskite structure, rare earth lead niobate, rare earth lead tantalate

ABSTRACT: Three new compounds and one known antiferroelectric compound with perovskite structure have been studied in the series of compounds of general formula $Pb(B^{3+}_{0.5}B^{5+}_{0.5})O_3$, where B^{3+} is Lu or Yb and B^{5+} is Nb or Ta. The purpose of the study was to discover new compounds with ferroelectric or antiferroelectric (and possibly ferromagnetic) properties, in view of indications in the literature of the possibility of obtaining such compounds in the $Pb(B^{3+}_{0.5}B^{5+}_{0.5})O_3$ series with rare-earth ions of small dimensions in octahedral sites. The polycrystalline compounds were synthesized by sintering oxides at 960—980C in an at-

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ACCESSION NR: AP5000679

mosphere of lead oxide vapors. X-ray study revealed a distorted perovskite structure in all four compounds. The dielectric constant measured with an IE-2 instrument at 500 khz was found at a maximum in the 270-300C range. Moreover, two additional low-temperature phase transitions were detected in Yb-containing compounds by dielectric-constant and dilatometric measurements. The phase transitions were identified as antiferroelectric on the basis of the linearity of the plot of dielectric constant versus the electric field potential. All the antiferroelectrics studied have a relatively high Curie point. The Curie points of Nb and Ta compounds and those of Lu and Yb compounds are practically the same. The linear thermal expansion is smaller in paraelectric than in antiferroelectric phase. The antiferroelectric properties of the new compounds were compared with those of known ferroelectrics. Orig. art. has: 1 figure and 1 table.

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute of Semiconductors, AN SSSR)

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

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ACCESSION NR: AP5000679

SUBMITTED: 07Jul64	ENCL: 00	SUB CODE: MT,EM
NO REF SOV: 004	OTHER: 001	ATD PRESS: 3153

Card 3/3

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

KRAYNIK, N.N.; ISUPOV, V.A.; BRYZHINA, M.F.; AGRANOVSKAYA, A.I.

Crystal chemistry of ferroelectrics having a structure of the type of tetragonal oxygenic tungsten bronze. Kristallografiia 9 no.3:352-357 My-Je '64. (MIRA 17:6)

1. Institut poluprovodnikov AN SSSR.

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

BR

S/0048/64/028/004/0653/0657

ACCESSION NR: AP4030638

AUTHOR: Isupov, V.A.

TITLE: Toward an explanation of some of the properties of ferroelectric materials with a diffuse phase transition [Report, Symposium on Ferromagnetism and Ferroelectricity held in Leningrad 30 May to 5 June 1963]

SOURCE: AN SSSR. Izv. ser.fiz., v.28, no.4, 1964, 653-657

TOPIC TAGS: ferroelectric material , ferroelectric relaxation, ferroelectric phase transition, ferroelectric domain

ABSTRACT: The phase transition in some ferroelectric materials is diffuse and the materials exhibit relaxation phenomena (e.g.,the temperature at which the dielectric constant reaches its maximum depends on the frequency at which it is measured). The kinetics of the diffuse phase transition is discussed, and it is concluded that the diffuseness of the transition and the relaxation phenomena are causally related. All the materials concerned have ions of more than one type on crystallographically identical sites, and it is therefore possible for the composition to vary from place to place within the crystal. Such variations of composition give rise to variations

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ACCESSION NR: AP4030638

of the Curie temperature with position, and it is to these that the diffuseness of the phase transition is assumed to be due. The concepts of domainoid and negative domainoid are introduced: a domainoid is a region of spontaneous polarization surrounded by unpolarized material (in contrast to a domain, which is surrounded by polarized material), and a negative domainoid is an unpolarized region surrounded by polarized material. As the crystal is cooled from above the Curie region, domainoids first appear. These increase in number and size, and finally, by coalescing and surrounding each other, they give rise to domains. The domains, however, contain negative domainoids. Thus, over a wide range of temperature, domainoids (positive and negative) are present which are near their Curie temperature, and which therefore give rise to relaxation phenomena. Moreover, the boundary between two domains will tend to pass through a maximum number of negative domainoids. This not only favors relaxation phenomena involving domain wall movement, but also accounts for the abnormally thick domain walls sometimes observed (V.A.Bokov and I.Ye.My*l'nikova, Fizika tverdogo tela,3,841,1961). Some piezoelectric and optical properties of $PbMg_{1/3}Nb_{2/3}O_3$ reported by G.A.Smolenskiy, V.A.Isupov, A.I.Agranovskaya and S.N.Popov (Fizika tverdogo tela,2,2906,1960) and by V.A.Bokov and I.Ye.My*l'nikova (loc.cit.) are discussed briefly. Orig.art.has: 1 figure.

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

ACCESSION NR: AP4030638

ASSOCIATION: Institut polyprovodnikov Akademii nauk SSSR (Institute of Semiconductors, Academy of Sciences, SSSR)

SUBMITTED: 00 DATE ACQ: 30Apr64 ENCL: 00

SUB CODE: EM NR REF SOV: 012 OTHER: 004

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

ISUPOV, V.A.; KRAYNIK, N.N.

New antiferroelectrics with Peroskite structure containing rare-earth ions in their octahedral lattice points. Fiz. tver. tela 6 no.12:3713-3715 D '64 (MIRA 18:2)

1. Institut poluprovodnikov AN SSSR, Leningrad.

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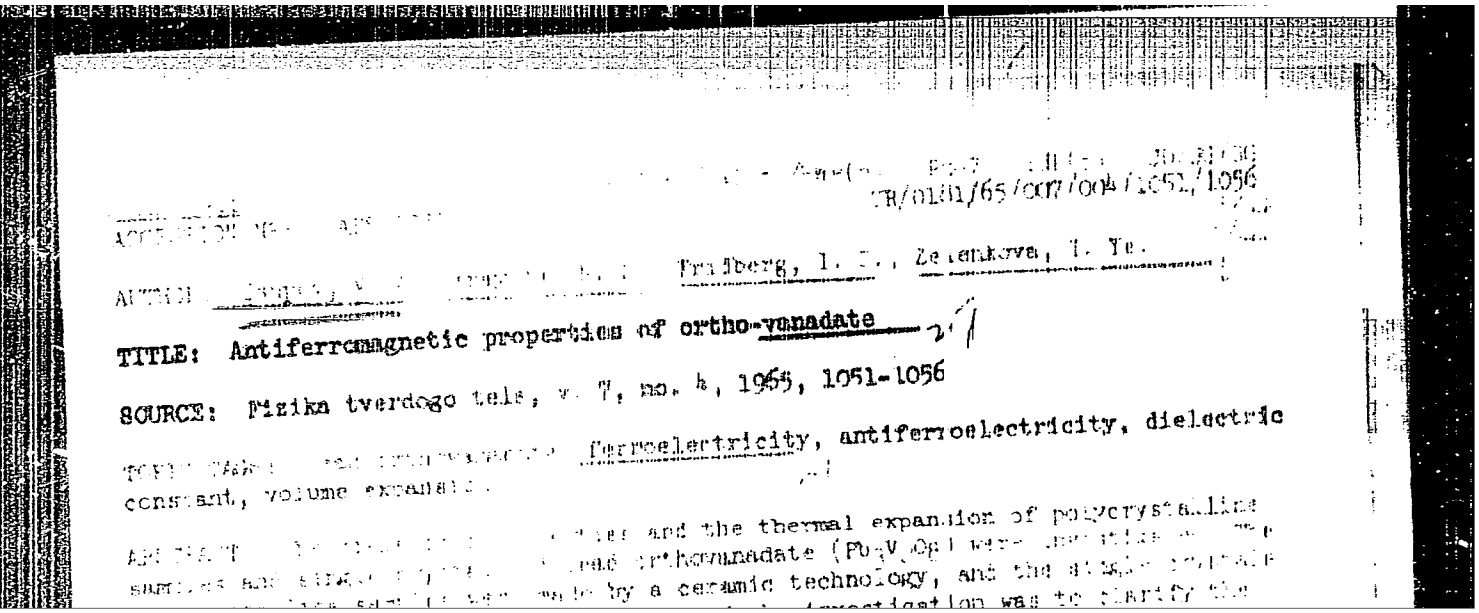

AUTHOR: Fridberg, L. Z., Zelenkova, T. Ye.

TITLE: Antiferromagnetic properties of ortho-vanadate

SOURCE: Fizika tverdogo tela, v. 7, no. 4, 1965, 1051-1056

TOPIC TAGS: ferroelectricity, antiferroelectricity, dielectric constant, volume expansion

ABSTRACT: [illegible] and the thermal expansion of polycrystalline [illegible] orthovanadate ($Pb_3V_2O_8$) were [illegible] by a ceramic technology, and the [illegible] investigation was to clarify the

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has been demonstrated ... first-order transition.

the low-temperature phase transition are first-order transitions.

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...ied by relatively small but abrupt changes in the dielectric constant and by very ... of the single crystals in polarized light perpendicular to the ... sed the presence of a twin structure with van... high dielectric constant, its maximum near ...°C,

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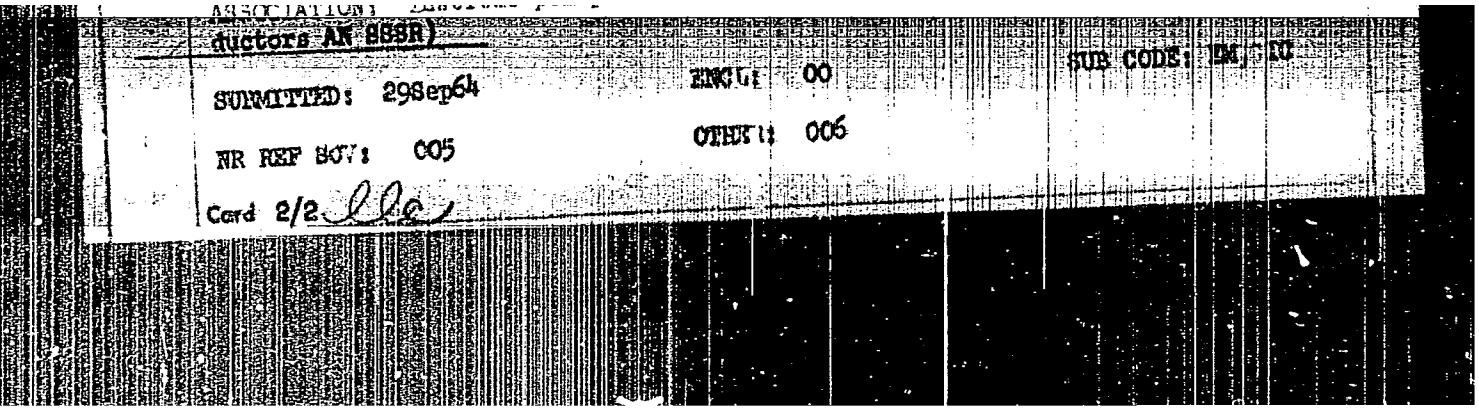

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L 6971-66 EWT(m)/EWP(t)/EWP(b) IJP(c) JD

ACC NR: AP5017327 SOURCE CODE: UR/0181/65/007/007/2221/2223

48
43
B

AUTHOR: Isupov, V. A.

ORG: Institute of Semiconductors, AN SSSR, Leningrad (Institut poluprovodnikov AN SSSR)

TITLE: Antiferroelectric properties of the lead silicate Pb_4SiO_6

SOURCE: Fizika tverdogo tela, v. 7, no. 7, 1965, 2221-2223

TOPIC TAGS: ferroelectricity, sintered metal, crystal chemistry, lead compound, silicate

ABSTRACT: To study the phase transition of Pb_4SiO_6 that occurs at about 155°C and changes the volume, its dielectric properties were investigated. Samples were made by ordinary ceramic methods from chemically pure PbO and SiO_2. Preliminary annealing was done at 600°C for 6 hours, and the material was sintered at 650°C for 6 hours. Disc shaped samples were made for the dielectric measurements of 9 mm diameter and 0.7-1.5 mm thickness, and cylindrical samples of 30 mm length were made for the dilatometric measurements. X-ray analysis assured that the samples were single phase with composition Pb_4SiO_6. A graph of the results is shown in fig. 1. The dielectric permeability goes through a maximum for the interval 155-180°C and for higher temperatures decreases steadily according to the Curie-Veyuss law

$$\varepsilon = \varepsilon_0 + \frac{C_W}{T - \theta'}$$

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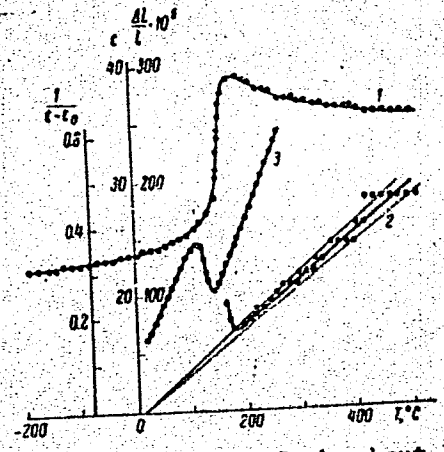

Fig. 1. Temperature dependence of dielectric permeability for 500 kilohertz (1), $1/(\varepsilon-\varepsilon_0)$ (2) and the thermal expansion $\Delta l/l$ (3) of polycrystalline samples of lead silicate Pb_4SiO_6.

where $\theta' = 277°K$ and C_w is about 1000°K. These results showed that the phase transition in Pb_4SiO_6 is antiferroelectric; however, this transition differs from others in the low increase in $\varepsilon-\varepsilon_0$ and in the low value for C_w. The data are explained in terms of crystal chemistry. The cell structure and the ionic radii of cations and anions are compared to those of other antiferroelectric materials to establish a basis for these properties. Ferroelectric and antiferroelectric properties are found

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ACC NR: AP5017327

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to be unrelated to any particular crystal structure or lattice pecularity. However, the electronic and ionic polarizations were generally high in these materials. "The author expresses his gratitude to G. A. Smolyenskiy for his interest and to L. V. Bunyayeva and L. G. Kononova for their participation in the work." Orig. art. has: 1 figure.

SUB CODE: EM,MM/ SUBM DATE: 10Feb65/ ORIG REF: 007/ OTH REF: 009

Card 3/3

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

L 7853-66 EWP(e)/EPA(s)-2/EWT(m)/EWP(i)/EPA(w)-2/EWP(t)/EWP(b)/EWA(h) IJP(c)
ACC NR: AP5028116 JD/WH SOURCE CODE: UR/0048/65/029/011/2042/2045

AUTHOR: Buyanova, Ye.A.; Strelets, P.L.; Serova, I.A.; Isupov, V.A.

ORG: none

TITLE: Ferroelectric properties of lead titanate - lead zirconate - lead nickoloniobate solid solutions /Report, Fourth All-Union Conference on Ferroelectricity held at Rostov-on-the Don 12-16 September 1964/

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 29, no. 11, 1965, 2042-2045

TOPIC TAGS: ferroelectric material, solid solution, lead titanate, zirconate, niobate, nickel, dielectric constant, dielectric loss, piezoelectric modulus, elastic modulus, phase transition

ABSTRACT: The Curie points, dielectric constants, piezoelectric moduli, and elastic moduli of 13 solid solutions of the $PbTiO_3$ - $PbZrO_3$ - $Pb(NiNb_2)_{1/3}O_3$ system were measured in order to investigate the behavior of the system near the morphotropic phase boundary. The materials were synthesized from the oxides at 700-800°C for 2-3 hours and sintered at 1100-1160°C. The lead oxide loss and water absorption did not exceed 2% and 0.1%, respectively. X-ray studies showed all the materials to consist of a single phase with the perovskite structure. All the investigated specimens contained between 35 and 50 mole % $PbTiO_3$, between 25 and 55% $PbZrO_3$, and between 10 and 30% $Pb(NiNb_2)_{1/3}O_3$. The Curie temperature decreased monotonically with increasing

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ACC NR: AP5028116

$Pb(NiNb_2)_{1/3}O_3$ and $PbZrO_3$ content and showed no anomaly at the morphotropic phase boundary between the tetragonal and rhombohedric modifications. The elastic compliance, phiezoelectric modulus, and dielectric constant showed broad maxima at the morphotropic phase boundary, but the dielectric loss varied monotonically. The failure of the dielectric loss to show a maximum at the phase transition is surprising, and an optical investigation of the behavior of the domain structure under the action of an electric field should be undertaken. The ratio of $PbTiO_3$ to $PbZrO_3$ concentrations at the morphotropic phase boundary decreased with increasing $Pb(NiNb_2)_{1/3}O_3$ content. This suggest that $Pb(NiNb_2)_{1/3}O_3$ is not tetragonal in the ferroelectric state and that a morphotropic phase boundary may be possible in the $PbTiO_3$ - $Pb(NiNb_2)_{1/3}O_3$ system. Some of the investigated solid solutions had rather large piezoelectric moduli, low sound velocities, and high stability of the resonance frequency, and these materials sintered at lower temperatures than the 47% $PbTiO_3$ - 53% $PbZrO_3$ solution. Orig. art. has: 2 figures and 1 table.

SUB CODE: SS,EM,ME SUBM DATE: 00/ ORIG. REF: 004 OTH REF: 003

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"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

ISUPOV, V.A., inzh.; LIVSHITS, Ya.N., inzh.; ZHILYAYEV, M.P., inzh.

Tourniquet type tilting device for steel plates. Sudostroenie 31 no.4:43-45 Ap '65. (MIRA 18:8)

APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3"

"APPROVED FOR RELEASE: 08/10/2001 CIA-RDP86-00513R000618920002-3

L 25444-66 EPF(n)-2/EWT(1)/EWT(m)/ETC(m)-6/EWP(e) WH

ACC NR: AP6009701 SOURCE CODE: UR/0181/66/008/003/0972/0974

AUTHORS: Strukov, B. A.; Minayeva, K. A.; Skomorokhova, T. L.; Isupov, V. A.

ORG: Moscow State University im. M. V. Lomonosov (Moskovskiy gosudarstvennyy universitet); Institute of Semiconductors, AN SSSR, Leningrad (Institut poluprovodnikov AN SSSR)

TITLE: Thermal properties of antiferroelectric ceramic $PbMg_{1/2}W_{1/2}O_3$

SOURCE: Fizika tverdogo tela, v. 8, no. 3, 1966, 972-974

TOPIC TAGS: antiferroelectric material, lead compound, thermal effect, specific heat, temperature dependence, phase transition, dielectric constant, electric hysteresis, antiferroelectricity, metal ceramic material

ABSTRACT: The authors report results of measurements of the excess energy of the antiferroelectric phase transition in $PbMg_{1/2}W_{1/2}O_3$, and compare the results with those previously obtained for this compound. The specific heat was measured by a method described by one

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of the authors earlier (Strukov, FTT v. 6, 2862, 1964). The results show that the specific heat exhibits an anomalous increase in the temperature interval between 24 and 36C, rising from about 30 to 164 cal/mole-deg at 30.5C and then dropping again to about 29 cal/mole-deg. This anomaly at the vicinity of the Curie point indicates that the phase transition is of first order. Slight fluctuations on both sides of the maximum are briefly discussed but are shown not to be connected with any additional phase transition. The temperature dependence of the dielectric constant exhibits a hysteresis, likewise showing that the phase transition is of first order. The results can be reconciled with the theoretical temperature dependence of the square of the spontaneous antipolarization. The excess heat of the phase transition is determined from the temperature dependence of the specific heat and is found to be 276 cal/mole. The corresponding resultant change in volume is -0.22 cm^3/mole, which is in fair agreement with results by others based on calculations. The authors thank V.A. Koptsik for interest in the work and valuable remarks, and N.N. Kraynik for supplying experimental data on thermal expansion of the investigated ceramic. Orig. art. has: 2 figures and 3 formulas.

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